

Abstracts of Technical Articles from Bell System Sources

*A Loud Speaker Good to Twelve Thousand Cycles.*¹ L. G. BOSTWICK. A loud speaker, designed for use as an adjunct to existing types of speakers to permit efficient sound radiation at the higher audible frequencies, is described. The structural and performance characteristics are indicated, and some of the advantages and limitations of such a loud speaker are discussed.

*Indicating Meter for Measurement and Analysis of Noise.*² T. G. CASTNER, E. DIETZE, G. T. STANTON, and R. S. TUCKER. This paper describes a visual indicating meter for the measurement of noise and other sounds. Its design is based on the known characteristics of sound and hearing, which are summarized. Particular attention has been paid to the response of the meter to sounds of short duration. The aim has been to make the meter both simple in operation and portable. An attachment for the frequency analysis of noise is under development. Several fields of use of the meter and analyzer are indicated.

*Some Applications of Bell System Instrumentalities and Practice to Railroad Communication Problems.*³ F. A. COWAN. Railroad communication problems are fundamentally similar to those encountered in the Bell System. As a result, the instrumentalities and practices developed for telephone company use are, to a large extent, applicable to railroad company use. Suitable Bell System circuits and equipment have, therefore, been made available to the railroad companies. Likewise, by means of representation on the American Railway Association committees, and by participation in conventions and joint discussions wherever practicable, information regarding many of the more general telephone company practices has been incorporated in the Railway Association codes.

There are, of course, some conditions which are peculiar to railroad operating procedure or plant. In these cases existing Bell System instrumentalities have been adapted for use, or new equipment suited to the particular cases involved has been developed. Catalogues and papers listing and describing this special equipment, together with

¹ *Jour. S. M. P. E.*, May, 1931.

² Published in abridged form in *Elec. Engg.*, May, 1931.

³ *Proc. Amer. Railway Assoc.*, Sept., 1930.

instructions regarding its use and maintenance, have been published.

Certain classes of equipment cannot be readily treated on a general basis and specific studies of individual cases are required to insure effective application to the railroad use. Where such equipment is requested by the railroad companies the telephone company undertakes the necessary studies and furnishes the apparatus to the railroad companies on a rental basis.

Extensive use has been made of the various Bell System services by the railroad companies. Examples of the more general applications are: dispatcher and way station telephone sets, selector signaling apparatus, private branch exchanges, loud speaking equipment, cable, telephone repeaters and loading coils.

*The Call Announcer: A Telephone Application of Sound Picture Ideas.*⁴ O. M. GLUNT. Fundamental research and development work carried on with a particular objective in one field contributes in many cases to the solution of problems in other fields. A typical example is the application of the sound reproducing elements, developed for use primarily in sound picture theater reproducing systems, in the solution of an intricate problem in telephone system operation. This article outlines the communicating problem which was presented and describes the apparatus which was developed, employing adaptations of sound picture principles to meet the need.

*Design and Installation of Toll Cable in the Bell System.*⁵ GLEN IRELAND. This paper discusses the present status of the toll cable network of the Bell System, indicates plans for its extension and describes recent improvements in toll cable, including tape armored cable, loading coils and telephone repeaters. Present maintenance methods for toll cable circuits are also dealt with.

*A Rapid Method of Estimating the Signal-to-Noise Ratio of a High Gain Receiver.*⁶ F. B. LLEWELLYN. It is shown that a figure of merit for the signal-to-noise ratio in a receiving system is obtained directly by noting how much the total noise output increases when the input circuit is tuned through resonance, in the absence of signal. The effect of mismatching the antenna and input circuit impedances is discussed, and it is concluded that although a small improvement may be obtained in certain ideal cases by making the circuit impedance much higher than the antenna impedance, other considerations

⁴ *Jour. S. M. P. E.*, March, 1931.

⁵ *Proc. Amer. Railway Assoc.*, Telegraph and Telephone Section, Sept., 1930.

⁶ *Proc. I. R. E.*, March, 1931.

indicate that the matched impedance condition gives the best results in practice.

*The World's Most Powerful Microscope.*⁷ F. F. LUCAS. In the last ten years there has been developed at Bell Telephone Laboratories a new technic of high-power micrography, which has greatly extended the limits of useful magnification possible with a microscope. Since any extension of the limits of magnification of the microscope which is accompanied by a decrease in definition is useless, it was found necessary to increase the resolving power or definition of the microscope. One way in which this can be done is by decreasing the wave length of the light used.

A microscope using ultra-violet light was developed about thirty years ago by Koehler of the Zeiss works. Due to various difficulties in operating it, this microscope soon became a scientific curiosity and was almost forgotten. About five years ago, a microscope of this type was obtained from the Zeiss works by Bell Laboratories, and the difficulties involved in the use of this instrument were largely solved by the development of a mechanical method of focusing. With this microscope, it is possible to obtain crisp, brilliant images of metallurgical specimens magnified 5000 to 6000 diameters. In studying the advantages and limitations of this microscope, it was found to be particularly applicable to the study of biological and medical specimens. Such specimens can be examined at high magnification under the ultra-violet microscope without the necessity of cutting, staining, or injuring them in any way.

*A Direct Reading Audio-Frequency Phase Meter.*⁸ W. R. MACLEAN and L. J. SIVIAN. In connection with certain acoustic studies it was desired to measure sound pressures as vectors, i.e. to determine both the amplitudes and the phase angles. An example, more fully described at the end of the paper, is the measurement of the amplitude and phase variations in the pressure at various points in a room excited by a tone from a loudspeaker. If a microphone traverses a path in the room the amplitude and phase changes in its output voltage are equal to the corresponding changes in the sound pressure. Thus, the measurement is reduced to an electrical one, except for the absolute calibration of the microphone and associated electrical circuit. At any one frequency, relative changes of amplitude and phase with position usually are all that is of interest, in which case no calibration is necessary.

⁷ *Jour. S. M. P. E.*, April, 1931.

⁸ *Jour. Acous. Soc. of America*, April, 1931.

*Formation of Photographic Images on Cathodes of Alkali Metal Photoelectric Cells.*⁹ A. R. OLPIN and G. R. STILWELL. A method of forming both negative and positive photographic images on the cathodes of potassium and sodium photoelectric cells in vacuum is described. These images are sharp and clear in every detail and can be permanently "fixed" by proper treatment. Among the materials which have been successfully used in treating the exposed surfaces to bring out these images are sulphur vapor, air, oxygen and hydrogen in the ratio of 9 to 1, hydrofluoric acid and bromine. During the time the image is forming, the photoelectric sensitivity of the illuminated portions decreases approximately 30 per cent. After the image is fixed as a permanent record there is little difference between the sensitivity of the cathode area bearing the image and neighboring areas. Photographs of photoelectric cells are shown in which such photographic images are plainly visible.

*Ausgleichsströme bei parallelen Einzelleitungen, von denen die eine in der Erde liegt und unendlich lang ist.*¹⁰ JOHN RIORDAN. This paper gives the formula for the electric force in a homogeneous semi-infinite flat earth due to unit step current (zero for time less than zero, unity for time greater than zero) in an infinite wire above the earth. The corresponding formula for the electric force in the air, due to F. H. Murray, has been published in the *Bell System Technical Journal* for October, 1930, equation (4) of L. C. Peterson's paper; the two formulas agree at the surface of the earth. The present formula is given in finite form in terms of the exponential function and the error function complement.

*A Modern Laboratory for the Study of Sound Picture Problems.*¹¹ T. E. SHEA. Recently there has been provided among the research facilities of Bell Telephone Laboratories, Inc., a separate building which is intended solely for sound picture research and development work. The prime objects of the laboratory are to find out the best methods and technic for employing sound picture recording and reproducing apparatus now in use, and of making improvements in recording and reproduction. The building contains a recording studio, film processing plant, and review room, together with testing laboratories.

⁹ *Jour. Opt. Soc. Amer.*, March, 1931.

¹⁰ *E. N. T.*, Band 8, Heft 3, March, 1931.

¹¹ *Jour. S. M. P. E.*, March, 1931.